b. computing a deviance of the data values for each cell of each cross-tab using formula (1):

$$d(i_1,\cdots,i_d) = \frac{\left(n(i_1,\cdots,i_d) - e(i_1,\cdots,i_d)\right)}{\sqrt{e(i_1,\cdots,i_d)}} \qquad (1)$$

where:

$n(i_1,\cdots,i_d)$ is the actual value of the cell at location $(i_1,\cdots,i_d)$;

$s_k(i_k) = \sum_{j=1}^{D_k} n(i_1,\cdots,i_j,\cdots,i_d)$ is the sum of all cell values along the kth dimension;

$S = \sum_{j_1=1}^{D_1}\cdots\sum_{j_k=1}^{D_k}\cdots\sum_{j_d=1}^{D_d} n(j_1,\cdots,j_d)$ is the total sum of all cell values in the cross-tab;

$e(i_1,\cdots,i_d) = \frac{\prod_{j=1}^{d} s_j(i_j)}{S^{d-1}}$ is the estimated value for the cell at location $(i_1,\cdots,i_d)$;

$d$ is the dimension of the cross-tab; and

$D_k$ is the number of cells in the kth dimension; and

c. ranking the deviances; and

d. selecting the cross-tabs containing the cell having a deviance, the absolute value thereof being greater than a desired value.

2.(**original**) The method of claim 1, further comprising the step of:

filtering or qualifying the cross-tabs based on sparsity where sparsity is the number of cells that do not or cannot have a value.

3.(**original**) The method of claim 1, further comprising the step of:

filtering cross-tabs k, where k is an integer having a value less than or equal to the dimension





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of the cross-tab.

4.(**original**) The method of claim 1, further comprising the step of:

limiting the number of cross-tabs displayed.

5.(**currently amended**) A method implemented on a digital process unit for analyzing data in a multi-dimensional dataset comprising the steps of :

a. selecting n variables from a multidimensional dataset, where n is an integer less than or equal to the dimensionality of the dataset;

b. selecting a cross-tab dimension, m, where m is an integer having a value less than or equal to n or having a range of values between a lower limit greater than to equal to 1 and an upper limit less than or equal to n;

c. constructing k cross-tabs of dimension m, where k is the number of combinational cross-tabs derived from n variable taken m at a time; and

d. do ranking;

e. displaying a list of the ranked cells with cross-tab identification information;

f. selecting a desired cell from the list;

g. display the corresponding cross-tab with highlight cell.

6.(**original**) The method of claim 5, wherein list manipulation to display top x positive and negatives with middle hidden.

7.(**currently amended**) A graphics windowing routine implemented on a digital process unit for displaying data in a multi-dimensional dataset comprising:

a window including a pane and a drop down box associated with the pane designed to allow selection between different pane display formats for the pane.

8.(**original**) The routine of claim 7, further comprising at least two pane, pane splitters separating the panes and a drop down box associated with each pane designed to allow selection between different pane display formats for each pane.

9.(**currently amended**) A GUI implemented on a digital process unit for displaying, manipulating, and analyzing data in a multi-dimensional dataset comprising:

a. a polyscope graphics routine; and
b. a hierarchical value-based graphics routine
c. a polystar graphics routine;
d. a tree graphics routine;
e. cross-tab pixel graphics routine; and
f. surface routine.

10.(**currently amended**) A method implemented on a digital process unit for analyzing data in a multi-dimensional dataset comprising the steps of:

a. generating a decision tree from a dependent cross-tab having a dimension m, where m is an integer having a value less than n where n equal to the total number of variable in a dataset and where the remaining variable are independent variables;
b. searching the decision tree for dependent cross-tabs having corresponding relative cell values significantly different from the cell values in the root cross-tab to produce at least one interesting cross-tab; and
c. converting each interesting cross-tab into a corresponding filtered dependent cross-tab where the filter represents the decision tree path leading to each interesting cross-tab.

11.(**original**) The method of claim 10, further comprising the step of:

display the decision tree as a hierarchical graphic or tree graphic;

12.(**original**) The composition of claim 10, further comprising the step of:

selecting a node, and

highlighting the dependent cross-tab in a cross-tab decision tree or changing the data in the single dependent cross-tab to correspond to the data in the selected node.

13.(**currently amended**) A method implemented on a digital process unit for constructing a decision tree from data in a multi-dimensional dataset comprising the steps of:

selecting m dependent variables from a set of n variables, where n and m are integers and m has a value less than n and the remaining n-m variable are independent variables;

converting the m dependent variables into a single hybrid variable;

display the hybrid variable as a dependent variable cross-tab; and

classifying the hybrid variable relative to the independent variables using a decision tree classifier to form a decision tree of dependent variable cross-tabs.

14.(**original**) The method of claim 13, further comprising the step of:

selecting a node of the decision tree; and

performing cross-tab operations, where the cross-tab operations include at least one of the graphics routines of the GUI of claim x.

15.(**original**) The method of claim 13, further comprising the step of:

analyzing each cross-tab to generate cross-tab data.

16.(**original**) The method of claim 13, further comprising the step of:

displaying the cross-tab data in a hierarchical graphics routine.

17.(**original**) The method of claim 13, further comprising the step of:

constructing an equivalent cross-tab representation of the decision tree, where the cross-tab representation comprises a plurality of dependent variable cross-tabs where the plurality is equal to a product of a dimension of each independent variable where data in each dependent variable cross-tab derives from the intersecting independent variables.

18.(**currently amended**) A method implemented on a digital process unit for discovering and ranking "Interesting" relationships from data in an N-dimensional data cube, the method comprising the steps of:

enabling a Discovery Process to find all N-Dimensional Cross-tabs in a data cube and on discovery of an N-Dimensional Cross-tab, calculate an Interest Factor for each Cross-tab Cell included in said Cross-tab where the Interest Factor denotes a measure of statistical significance between the Cross-tab Cell and all other Cross-tab member Cells and where an N-Dimensional Cross-tab Query String that references said Cross-tab Cell and it's member Cells is inserted into a Ranked List where said Ranked List is sorted relative to said Cross-tab Cell's Interest Factor.

19.(**currently amended**) A method implemented on a digital process unit for discovering and ranking "correlated" relationships from data in an N-dimensional data cube, the method comprising the steps of:

identifying a Dependant Cross-tab (consisting of two or more dimensions and a measure) and enabling a Pivot Tree Discovery Process wherein an Enhanced Decision Tree Algorithm will evaluate all remaining dimension members (those that do not make up the Dependant Cross-tab) with respect to the said Dependant Cross-tab and to generate an Enhanced Decision Tree Output Data based on the strength of correlation to the said Dependant Cross-tab.

20.(**currently amended**) A method implemented on a digital process unit for visualizing a Decision Tree representing data and data relationships derived from a multi-dimensional dataset, the method comprising the steps of:

reading the Decision Tree Output Data from a Decision Tree algorithm and visually displaying a Decision Tree using a concentric ring structure where the center ring (or circle) represents the root node and each subsequent node split (tree level) is represented as an additional annular ring extending away from the root node.

21.(**currently amended**) A method implemented on a digital process unit for visualizing a Decision Tree representing data and data relationships derived from a multi-dimensional dataset, the method comprising the steps of:

reading the Decision Tree Output Data from a Decision Tree algorithm and visually displaying said Decision Tree Output Data using a Decision Tree Scatter Plot wherein the node-dept (level) is represented on the X-axis and the number of records are represented on the Y-axis (preferably a logarithmic scale).

22.(**currently amended**) An interface implemented on a digital process unit to a multi-dimensional database (MDD) for pre-processing queries to the MDD and post processing results from the MDD comprising a query receiver, a results sender, a query parser, a clause translator, a command sender, a data receiver and an operational construct assembler, where both sender and receiver can be combined into an exchanger and the parser and translator can be combined into a disassembler.

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Respectfully submitted,

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